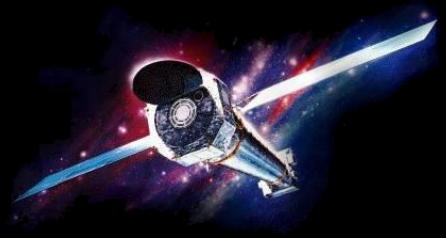
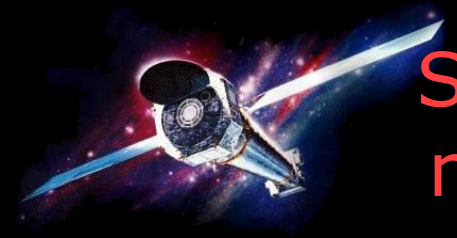


Contamination migration for the Chandra X-ray Observatory

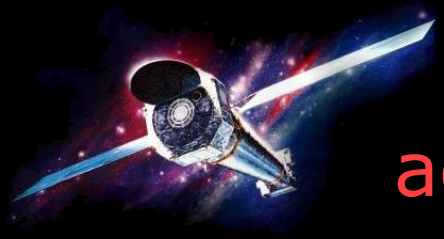
Contamination migration models and simulations
Geometric model and thermal models and simulations
X-ray absorption measurements and fits

NASA Marshall Space Flight Center
Lockheed-Martin
Massachusetts Institute of Technology
Smithsonian Astrophysical Observatory



Simulations of contamination migration within ACIS cavity

- Objectives
  - Identify regions of parameter space that produce observations.
  - Investigate scenarios to reduce contamination on ACIS OBFs.
- Methodology
  - Leverage off thermal analysis to study contamination transport.
    - Use same geometric model (view factors and areas) for ACIS.
    - Adopt surface temperatures determined in thermal analyses.
  - Solve coupled molecular-rate equations to evolve mass column.
    - Contaminant deposits on each surface from source, other surfaces.
    - Contaminant vaporizes from each contaminated surface.
    - Material leaving ACIS cavity either vents or returns.
- Status
  - Simulations are not yet producing observed distribution.
  - Need additional physics (multiple species, varying emissivity).



Simulations of contaminant accumulation onto ACIS OBFs

- Lower volatility contaminant
  - Deposition dominates.
    - Builds up more near center.
- Higher volatility contaminant
  - Vaporization dominates.
    - Cleans up near center.